Study on the impact of fiscal policy on capital markets in EU countries during actual financial crisis

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Abstract
The current economic crisis brought again into discussion the importance of interventionism versus auto-regulation market theory. In this context, fiscal policy has proven to be an important tool used by authorities to eliminate economic imbalances. The European Union Members States practice different taxes rates and regulations, within the limits (in fact very wide) of Stability and Growth Pact and not seems willing to give up this instrument for a common European fiscal policy. The crisis put its mark on the European capital markets too. Today in 27 European Member States the capital markets differ widely in terms of strengthens, having different behavior. In this paper we intend to analyze the impact of national fiscal policies on capital markets in the context of different rates of taxations of income across the European Union.

Keywords: fiscal policy, capital market, different taxes rates
JEL codes: E62, E44, F36

1.Introduction

European fiscal harmonization efforts failed as nowadays tax rates differ very substantially within European Union, ranging for corporate income tax from a minimum of 10 % in Bulgaria, Cyprus and Hungary to a maximum of 35 % in Malta, and for personal income tax from 10 % in Bulgaria to a maximum of 57 % in Sweden (Table 1).

This was seen in a Romanian study (Göndör, 2011) that as a rule, the new Member States display lower top rates, while the highest rates are typical of Member States with the most elevated overall tax ratios, such as Belgium, Denmark, Sweden, Netherlands. The lowest corporate tax rates in the Union are found in Bulgaria, Cyprus and Hungary.

Table 1: Different Direct Taxes Rates within European Union, 2011 Income, in %

Member State	Corporate Income Tax	Top Personal Income Tax
Austria	25	50
Belgium	33.99	50
Bulgaria	10	10
Cyprus	10	30
Czech Republic	19	15
Denmark	25	59
Estonia	21	20
Finland	26	30
France	33.33	40
Germany	30-33	45
Greece	25	45
Hungary	10/19	32
Ireland	12.50	41
Italy	31.40	43
Latvia	15	23
Lithuania	15	20
Luxembourg	21	38
Malta	35	35
Netherlands	20-25	52
Poland	19	32
Portugal	12.5/25	42
Romania	16	16
Slovakia	19	19
Slovenia	20	41
Spain	30	45
Sweden	26.3	57
United Kingdom	28	50

Source: Made by the authors using data from European Commission (2011) and Eurostat (2011)

On the other side, some of European Union countries have robust capital markets, others are significantly lagging behind. How do we explain such a variation? Is there any correlation between different tax rates and the varying degrees of strength in capital markets cross-nationally? It is possible to build a more coordinate European capital market in the absence of fiscal harmonization?

1.1. The Study Objectives

In this paper we intend to analyze the impact of national fiscal policies on capital markets in the context of different rates of taxations of income across the European Union. The main objective of the study is to demonstrate that fiscal policy is an important tool for influencing the domestic capital market strength. This empirical approach intends to provide new directions for the study of capital markets. It is hoped that this research will also help the policy makers to understand the inter-workings of fiscal policy on capital market growth.

1.2. The Study Methodology

Considering the corporate income taxes rates within European Union as independent variables, we established the influence of fiscal policy on the capital market strength. For measuring the strength of capital markets we chose several dependent variables, like inflation rate, interest rate, domestic market capitalization, stock market significance in the domestic economy, number of listed companies, value of share trading and turnover velocity of domestic shares, which take into account the different aspects of the European Union capital markets and provide for testable numbers on capital market strength between 2009-2010. These variables are derived from data supplied by European Commission, Eurostat and WFE – World Federation of Exchanges. We employed data mining techniques in an attempt to generate model trees outlining relationship between the Gross Dividend Yield (GDY), the Combined Corporate income Tax Rate (CTR) and other data from several European stock markets.

1.3. The Paper Structure

This paper is structured as follows: Section 1 presents the study objectives, the study methodology, the paper structure and the research status in the study field. Section 2 presents some theoretical considerations. Section 3 embodies the empirical analysis and data mining experiments**.** Section 4 concludes the study.

1.4. Research Status in the Studied Field

According to Anderson (2003) the literature in the field tends to focus on three specific theories: law and finance, endowment and finance, and politics and finance, posing different ideas and reaching different conclusions concerning the strength of capital markets.

Although Adam Smith himself pointed out many years ago that there is an important relationship between fiscal policy and capital market strength, many years have passed before other researchers have adopted his idea. Smith (1776, 1911) had argued that higher taxes would determine the investors to invest in countries with lower taxes rates because they could make more profit. This theory was empirically tested and extended by Levine (1991), who argued that entrepreneurs who invest in capital markets are placing their capital at considerable risk, and ”to see most of their returns taken away by taxes stifles the capitalist spirit”. According to the same author, certain fiscal policies can create incentives for entrepreneurs to invest within the capital markets thus influencing its strength. Levine (1991) concluded that a reduction in corporate tax together with a fiscal policy of increasing consumption represents the key to long-term stimulate the economic and capital growth.

John Maynard Keynes (1936), Modigliani & Miller (1958) and Goldsmith (1969) demonstrated a relationship among stock market behavior and tax policy, jointly measured with the monetary policy, thus providing the base for the future research. Meek (1960) revealed the importance of fiscal policy by explaining the relationship between the federal deficits and capital market strength. He demonstrated that budget deficits cause the increase of interest rates which ‘crowd out’ investments, slowing economic and implicitly the capital market growth.

Some researchers denied the existence of any relationship between fiscal policy and capital market e.g. Barro (1974). The assumption of Barro’s Ricardian Equivalence Proposition stated that current government deficits become irrelevant for current portfolio substitution decisions by rational investors if they correctly anticipate increased future taxation.

Based on the assumption that there is a relationship between fiscal policy and capital market strength, some authors claimed its insignificance. Faini’s (2005) conclusion is that fiscal policy, despite the modality of measurement, matters but its effects are quite small, may impact the level of interest rates, nationally currency and the whole currency union as a whole.

Other authors argued stronger relation between fiscal policy and capital market strength, e.g. Ardagna et al. (2004), Balassone et al. (2004), Perotti (2005), Monacelli and Perotti (2006), Romer and Romer (2007).

The work of Laopodis (2007) is aimed, as he stated himself, "to fill the gap in the empirical financial literature by investigating the extent to which stock prices (or returns) incorporate all publicly available information on fiscal policy moves". The author argued that deficits do matter for the stock market thereby denying the Barro's (1974) Ricardian Equivalence Proposition of debt neutrality. Laopodis (2007) demonstrated that higher deficits increase the short term interest rate due to higher government borrowing thus influencing the capital market strength.

The financial crisis has increased the researchers concern for the effects of fiscal policy, enriching the literature in the field. Despite this, in the recent year's literature, there is very little empirical evidence to support the association of fiscal policy and the strength of capital markets.

Afonso and Martins (2010) have studied the relation between fiscal behavior and the shape of the yield curve in the U.S. and in Germany for the period 1981-2009, concluding that fiscal policy for sovereign debt does not influence de investor's decisions in case of countries usually seen as a safe haven. In the next year, Afonso et al. (2011) have found the evidence of nonlinearities in the effects of a fiscal shock depending on the initial conditions, determined by the existence of financial stress, diverse levels of government indebtedness, and implicitly assumed different monetary policy behavior, concluding that the transmission mechanism of fiscal developments may work differently depending on the form of stress, varying across countries and evolving over time.

Other authors like Li and St-Amant (2008), Mitra (2008), Mountford and Uhlig (2009), Afonso and Sousa (2009) have demonstrated the relation between fiscal policy and capital market strength.

By employing machine learning techniques in our research outlining the average daily trading on Bucharest Stock Exchange we demonstrated in our latest journal paper (Göndör and Bresfelean, 2011), that far from being a factor with small influence, fiscal policy is a major factor influencing capital markets. The novelty of our work consists of the idea that fiscal policy can be used by the government like very effective tool to deal with potential market inconsistencies and to attain redistributive goals. In this fashion, fiscal policy determines a positive development of the economic background and strengthens the capital markets.

Finally we can conclude that there is a substantial amount of literature on the topic of capital markets and economic growth, but there is still no definitive answer to what makes for a more robust capital market.

2. Theoretical considerations

Far from being a factor with small influence, fiscal policy is a major factor influencing capital markets. Its influence is manifested both in a direct and indirect way, determining the most of the others factors important for market capital strength, like interest rates, inflation rates and exchange rates.

The investors looking for the best profit will be attracted to countries with low corporate taxes, low interest and inflation rates and strong exchange rates. Reducing taxation may encourage investments and production, thus increasing the supply (for services and goods). As a result, fiscal policy can manipulate the drivers of inflation, demand and supply. Lower inflation rates increase investor confidence generating stronger capital markets. An increase of the inflation rate significantly superior to the interest rates will generate a weaker economic development in capital markets. This is the inflation related mechanism through which fiscal policy affects the capital markets strengths.

Regarding interest rates, most researchers reveal its impact on capital markets' strength; several authors emphasizing that it have a psychological effect on many investors. According to Anderson (2004), a low interest rate means for an investor the belief the incentive of investing will be superior to the risk of borrowing. In fact, the investment decision is a marginal benefit-marginal cost decision, thus the invest decision is based on the expectation of receiving future profits when the rate of return is greater than the interest rate. The question is if exists a determination between fiscal policy and interest rates. Large future

deficits and government debts generate a decrease in investor confidence which in turn generate adverse effects on the exchange rate, thus becoming clear the link between fiscal policy and interest rates.

The combined reaction of trade balance, consumption and real exchange rate which can be found on Perotti and Monacelli's (2006) and Corsetti and Müller's studies (2006) reveal the connection between fiscal policy and exchange rates.

Controlling inflation, interest rates and exchange rates are viewed as essential to building a capital market, as a result fiscal policies determine certain consequences on capital markets strength.

The effects of fiscal policy can differ in times of financial stress. Fiscal policy determines the size of government deficit and public debt; it can contribute to financial instability if generates substantial amounts of sovereign debt. If public debt generates uncertainty around the stability of European countries, it will erode investor confidence and raise the cost of investment capital, decreasing the strength of capital market.

3. **Empirical Analysis**

The financial crisis that started in 2007 is the worst Europe has faced since the 1930s. Public finances were severely hit. According to recent statistics (European Commission, 2011), the general budget deficit increased nine times in recent years. Over the years 2007 to 2010, fiscal balances deteriorated overall from an average deficit of 0.7% of GDP to 6.0% in the euro area and from 0.9% of GDP to 6.4% in the EU (Table no.2), even EU Member States are required by the Treaty to ensure that their government deficits do not exceed 3% of GDP. During the same period, the government debt increases from an average of 66.2% of GDP to 85.1% in the euro area and from 59.0% of GDP to 80.0% in the EU (Table no.2), even EU Member States are required by the Treaty to ensure that their government debt do not exceed 60% of GDP.

Table 2: EA17 and EU27 Government Deficit and Government Debt in crisis time

	2007	**2008**	**2009**	**2010**	**2010/2007**
Euro area (EA17)					
Government deficit (-)					
(million euro)	60 082	188 988	566 680	550 481	9.16
(% of GDP)	0.7	2.0	6.3	6.0	
Government debt					
(million euro)	5 984 848	6 472 881	7 116 276	7 837 207	1.30
(% of GDP)	66.2	69.9	79.3	85.1	
EU27					
Government deficit (-)					
(million euro)	108 011	296 010	803 807	784.107	7.26
(% of GDP)	0.9	2.4	6.8	6.4	
Government debt					
(million euro)	7 310 759	7 782 775	8 768 748	9 828 232	1.34
(% of GDP)	59.0	62.3	74.4	80.0	

Source: Made by the authors using data from Eurostat (2011)

According to European Commission (2011), there were large differences in the government deficits and national public debt, with part of the heterogeneity being due to sizeable differences across countries in public interventions to support the financial sector. According to Eurostat (2011), in 2010 the largest government deficits in percentage of GDP were recorded in Ireland (-32.4%), Greece (-10.5%), the United Kingdom (-10.4%), Spain (-9.2%), Portugal (-9.1%), Poland (-7.9%), Slovakia (-7.9%), Latvia (-7.7%), Lithuania (-7.1%) and France (-7.0%). The lowest deficits were recorded in Luxembourg (-1.7%), Finland (-2.5%) and Denmark (-2.7%). Estonia (0.1%) registered a slight government surplus in 2010 and Sweden (0.0%) was in balance. In all, 21 Member States recorded an improvement in their government balance

relative to GDP in 2010 compared with 2009 and six a worsening. At the end of 2010, the lowest ratios of government debt to GDP were recorded in Estonia (6.6%), Bulgaria (16.2%), Luxembourg (18.4%), Romania (30.8%), Slovenia (38.0%), Lithuania (38.2%), the Czech Republic (38.5%) and Sweden (39.8%). Fourteen Member States had government debt ratios higher than 60% of GDP in 2010: Greece (142.8%), Italy (119.0%), Belgium (96.8%), Ireland (96.2%), Portugal (93.0%), Germany (83.2%), France (81.7%), Hungary (80.2%), the United Kingdom (80.0%), Austria (72.3%), Malta (68.0%), the Netherlands (62.7%), Cyprus (60.8%) and Spain (60.1%).

The financial crisis has had a severe impact on European financial markets. Investors have suffered losses and, most important, a loss of confidence in the efficient functioning of the capital market.

3.1 **Data mining experiments**

Data mining (Hand et al., 2001) was defined as the analysis of (often large) observational data sets to find unsuspected relationships and to summarize the data in new ways understandable and useful ways to the user. Witten et al. (2011) believe there are four basically styles of learning in data mining applications:

- Classification learning – where the learning scheme is presented with a set of classified examples from which it is expected to learn a way of classifying unseen examples.
- Association learning – seeking for all associations among features.
- Data clustering – where groups of examples that belong together are sought.
- Numeric prediction – where the outcome to be predicted is a numeric quantity.

An interesting approach to numerical prediction is the Quinlan's M5 model tree which is based on ideas of decisions trees, following the rules of recursive partitioning of input space using entropy-based measures, and finally assigning class labels to ensuing subsets (Solomatine and Siek, 2004).

This procedure offered the advantages of knowledge discovery through analyzing the patterns in the Gross Dividend Yield evolution for several EU members, the named PIIGS countries (Portugal, Ireland, Italy, Greece and Spain). The trained model incorporated a large amount of statistics, learned efficiently and automatically produced multi-rule combinations over a set of data (Lee et al., 2007), (Solomatine and Siek, 2004):

- Split the input progressively,
- Chose a test that split the sample set T into subsets corresponding to the test outcomes and the same process was applied recursively to the subsets,
- Splits were founded on minimization of the intra-subset variation in the output values down each branch,
- In each node, the standard deviation of the output values was taken as a measure of the error of the node and calculating the expected reduction in error,
- The attribute that maximized the expected error reduction was then chosen.

The standard deviation reduction (SDR) is calculated by (Bhattacharya and Solomatine, 2005)

$$SDR = sd(T) - \sum_i \frac{|T_i|}{|T|} sd(T_i) \qquad (1)$$

Where: T is the set of samples that reach the node,

Ti - the subset of examples that have the i^{th} outcome of the potential set,

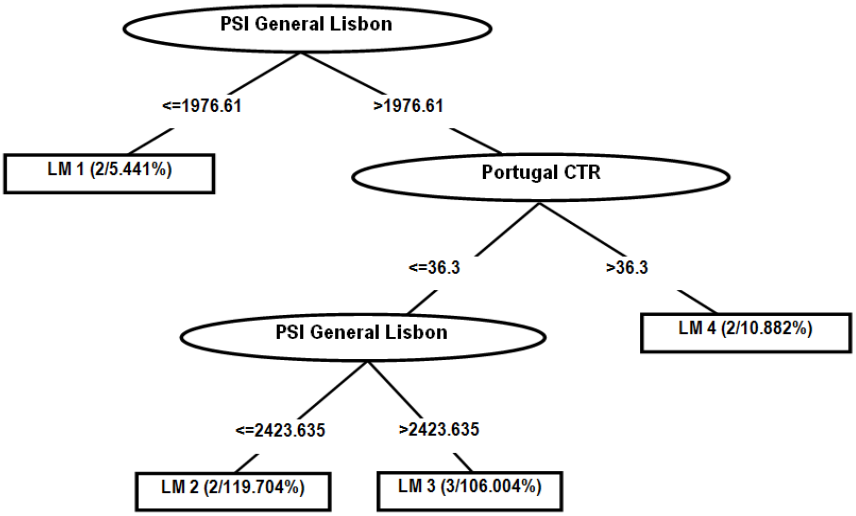
sd - the standard deviation.

These tasks were applied to datasets collected from the World Federation of Exchanges, containing the following variables from PIIGS capital market and fiscal policies, during the years 1990-2010: Total Number of listed companies, Domestic Market Capitalization, Value of Share Trading, Value of Bonds Listed, Total Value of Bond Trading, Price Earning Ratio (PER), Gross Dividend Yield (GDY), Combined Corporate income Tax Rate (CTR). In our experiments we used the Weka software, using the

M5P method. Weka was developed at University of Waikato and represents a collection of machine learning algorithms for data mining tasks, including tools for data pre-processing, classification, regression, clustering, association rules, and visualization.

We generated a M5P tree in graphical form for Portugal with the following structure (Figure 1):

Figure 1: M5P generated model tree for GDY - Portugal

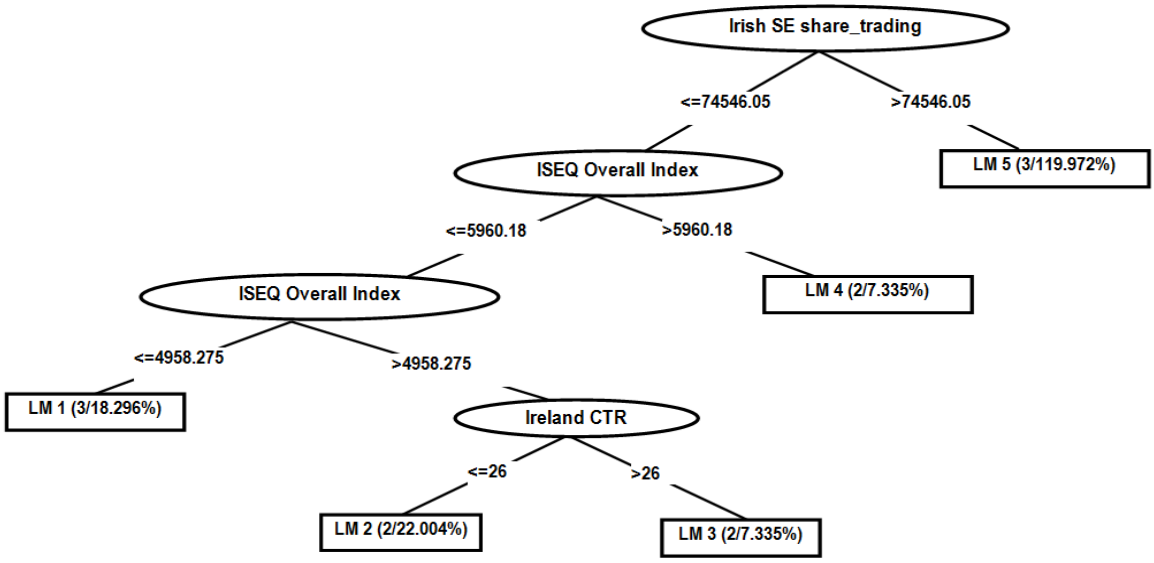


Source: authors' experiments based on data from World Federation of Exchanges

From this figure we can observe the importance of the variable PSI_General_Lisbon (Portuguese Stock Index) in the model tree, for being the root node. Under a value below or equal to 1976.61 it determines the LM1 model. The next split can be found at the variable Portugal_CTR (Combined Corporate income Tax Rate for Portugal) which, by exceeding the value of 36.3, determines the LM4 model. The last split is again on the PSI_General_Lisbon but with a point of reference value that ultimately determines LM2 and LM3 models. Based on each model's indicator we can observe that the model LM2 (119.704%) is the most representative of this tree, followed closely by LM1 (106.004%).

The generated M5P tree in graphical form for Ireland has the following structure (Figure 2):

Figure 2: M5P generated model tree for GDY - Ireland

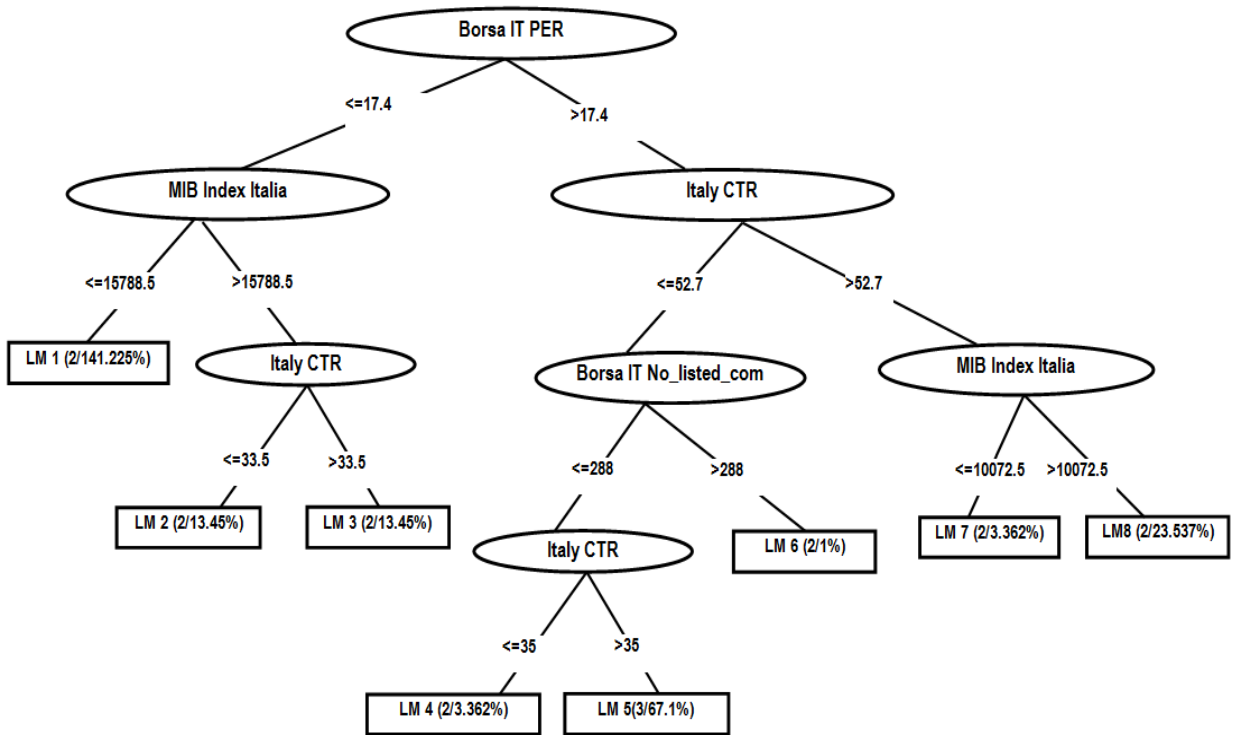


Source: authors' experiments based on data from World Federation of Exchanges

The root node in the model tree can be found at the Irish SE share_trading variable (Value of Share Trading on Irish Stock Exchange). For a value greater than 74546.05 million USD it determines the LM5 model. The next split can be found at the variable ISEQ Overall Index (Irish Stock Exchange Quotient) which, by exceeding the value of 5960.18, determines the LM4 model. The next split is again on the ISEQ Overall Index with a point of reference of 4958.275 that determines the LM1. The last split can be found at Ireland CTR (Combined Corporate income Tax Rate for Ireland) that for a value around 26 ultimately determines LM2 and LM3 models. We can observe that the model LM5 (119.972%) is the most representative of this tree, followed at a great distance by LM2 (22.004%).

The generated M5P tree in graphical form for Italy has the following structure (Fig. 3):

Figure 3: M5P generated model tree for GDY - Italy



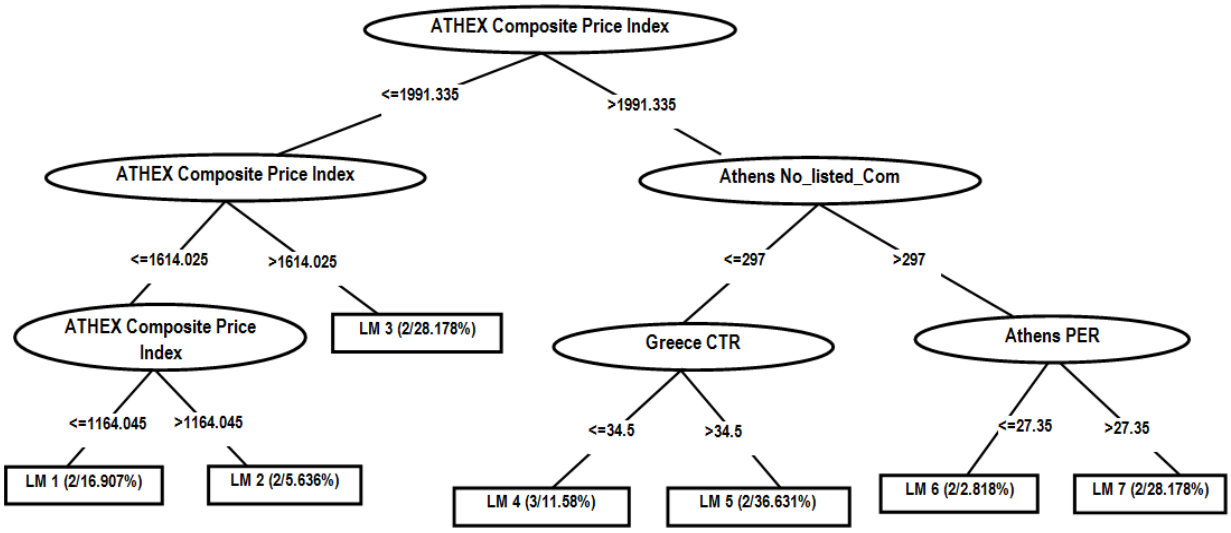
Source: authors' experiments based on data from World Federation of Exchanges

We can observe the importance of the variable Borsa_IT_PER (Price Earning Ratio for Italian stock exchange market) in the model tree, for being the root node for a value gravitating among 17.4. The next splits can be found at the variables Italy_CTR (Combined Corporate income Tax Rate for Italy) and MIB_Index_Italia (FTSE MIB, former S&P/MIB prior to June 2009, the benchmark stock market index for Borsa Italiana). Third level splits are at: Italy_CRT that generates the LM2 and LM3 models; at Borsa IT No_listed_com (number of listed companies in the Italian Stock market) that generates LM6; and at MIB Index Italia that generates LM7 and LM8 models. The last split is again at the Italy CTR variable, which finally generates LM4 and LM5 models.

From the figure's we can conclude that the model LM5 (67.1%) is the most representative of this tree, followed by LM8 (23.537%).

The generated M5P tree in graphical form for Greece has the following structure (Fig. 4):

Figure 4: M5P generated model tree for GDY - Greece

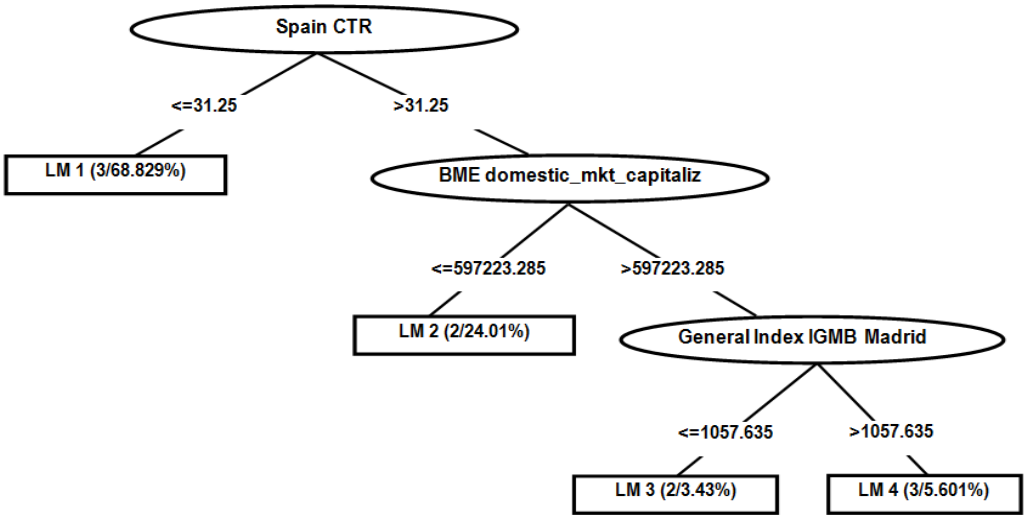


Source: authors' experiments based on data from World Federation of Exchanges

ATHEX Composite Price Index is the root node for this model tree, followed by the Athens No_listed_Com (number of listed companies in the Greek Stock market). ATHEX Composite Price Index on the second split generates the LM3 model. Third level splits include also Greece_CTR (Combined Corporate income Tax Rate for Greece) and Athens_PER (Price Earning Ratio for Greek stock exchange market) variables. The most representative model is LM5 (36.631%), followed closely by LM3 and LM7 (28.178%).

The generated M5P tree in graphical form for Spain has the following structure (Fig. 4):

Figure 4: M5P generated model tree for GDY - Spain



Source: authors' experiments based on data from World Federation of Exchanges

We can observe the importance of the variable Spain_CTR (Combined Corporate income Tax Rate for Spain) in the model tree, for being the root node. Under a value below or equal to 31.25 it determines the LM1 model. The next split can be found at the variable BME domestic_mkt_capitaliz

("Bolsas Y Mercados Espanoles" Combined Domestic Market Capitalization) which, under a value below or equal of 597223.285, determines the LM2 model. The last split is on the General Index IGMB Madrid with a point of reference value that ultimately determines LM3 and LM4 models. Based on each model's indicator we can observe that the model LM1 (68.829%) is the most representative of this tree, followed at a great distance by LM2 (24.01%).

From this data and the conducted experiments, we can avow that there is a relationship between the independent variables and the dependent variable serving as indicators for capital market strength.

4. Conclusion

This analysis validates the hypothesis that fiscal policy affects the strength of capital markets. The research conducted in this study provides a new set of variables to examine market strength. The empirical results show that corporate taxes influence the strength of capital markets in direct way and also indirect way, through inflation, interest rates, and exchange rates, being the main influence factor of capital market behavior. Lower corporate taxes, inflation and interest rates as well as strong exchange rates lead to stronger financial markets and consequently, stronger capital markets. The fiscal policy of the government determines the amount for these rates; as a result, fiscal policy has the power to strengthen the capital market. The strong connection between the dependent variables for market strength and the corporate tax rate, inflation rate, interest rate variables show that the strength of capital markets can be explained through fiscal policy rather than looking specifically at any of the four specific theories: law and finance, endowment and finance, politics and finance and monetary policy.

On the other hand, based on empirical evidence, we can conclude that the crisis has been so deep that there is a collective need for more financial market regulation and supervision. As a result a question arises: More financial market regulation and more supervision are possible without more coordinated national fiscal policies? Our opinion is that better fiscal harmonization is fundamental for creating a less vulnerable system.

Acknowledgements

Prof. Göndör's work was supported by the project "Post-Doctoral Studies in Economics: training program for elite researchers - SPODE" co-funded from the European Social Fund through the Development of Human Resources Operational Programme 2007-2013, contract no. *POSDRU/89/1.5/S/61755*.

Prof. Bresfelean's work was supported by *CNCSIS TE 316 Grant* "Intelligent methods for trading decision fundamentation on the stock market, based on public information".

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